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Annual ryegrasses in Atlantic Canada

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Recommendations for pesticide use in this publication are intended as guidelines only. Any application of a pesticide must be in accordance with directions printed on the product label of that pesticide as prescribed under the Pest Control Products Act. **Always read the label.** A pesticide should also be recommended by provincial authorities. Because recommendations for use may vary from province to province, consult your provincial agricultural representative for specific advice.

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Contents

Foreword

This publication replaces the bulletin entitled *Italian and Westerwolds ryegrasses: Performance, management, and use* (Agdex No. 127). The latest information on various aspects of production and use of annual ryegrasses is included in this revision, which was prepared by the Atlantic Advisory Committee on Forage Crops. Several individuals were involved in the preparation of this production guide including the members of the editorial committee of the Advisory Committee on Forage Crops, Peter Boswall, Dr. David McKenzie, Clinton McLean, and William Thomas.

C.B. Willis
Director

Steps in production and management of annual ryegrasses

- Select weed-free, well-drained fields.
- Test the soil.
- Apply lime if needed (annual ryegrass grows best at soil pH of 6.0 or greater).
- Apply phosphate and potash as per soil test results (manure is a good source of nutrients).
- Prepare seed bed so that it is level, fine, and firm.
- Choose a variety (Italian ryegrasses are leafy and suitable for pasture and green manure; Westerwolds ryegrasses are suitable for cutting and can be grazed later in the season).
- Seed early to maximize yields (diploids at 20–25 kg/ha, tetraploids at 25–35 kg/ha).
- Control weeds by mowing or spraying with 2,4-D or MCPA where necessary.
- Start grazing or cutting about 6–8 weeks after seeding.
- Apply nitrogen in the form of ammonium nitrate (33–0–0) as follows:

Time	*Rate (kg/ha)*
At seeding	100–150 (or equivalent amount in compound fertilizer)
After emergence	100–150
After first removal	
For pasture	150–200
For conserved forage	200–250
After subsequent removals	
For pasture	100–150
For conserved forage	150–200 (last application in early September)

Note: Other sources of nitrogen such as urea are also suitable; if manure is also used, adjust these rates.

- Graze until late fall; feed some fiber such as dry hay to animals grazing ryegrass.

Introduction

Italian ryegrass is a biennial from northern Italy where it was grown as a cultivated species in winter-irrigated meadows in the 13th century. Westerwolds ryegrass is an annual that was developed from Italian ryegrass in Holland in the early part of this century by selecting plants that produced seed in the year of sowing. Italian and Westerwolds ryegrasses are well adapted to conditions in the Atlantic Provinces, where they are grown as summer annuals, although some Italian ryegrasses may overwinter under favorable conditions.

In this publication Italian and Westerwolds rygrasses are called collectively annual ryegrasses. The two annual ryegrasses differ considerably in their growth habit (Fig. 1). Italian ryegrasses are leafy and tiller readily, which makes them suitable as pasture grasses. Westerwolds ryegrasses grow stemmy and upright; they range in height from 40 to 80 cm and may be used for cutting and grazing.

The chief users of annual ryegrasses are livestock farmers who find them suitable for supplemental pasture and cutting from mid summer to late fall. Annual ryegrasses, included in rotations with crops such as potatoes or corn, increase soil organic matter, improve soil structure, reduce soil erosion, and enhance crop health. This publication describes annual ryegrasses and their performance, management, and uses in the Atlantic Provinces.

Fig. 1 Westerwolds ryegrass (*left*) becomes stemmy as it matures whereas Italian ryegrass (*right*) is leafy with few stems.

Role of annual ryegrasses

Annual ryegrasses grow well on a variety of soils and may be included in a number of rotations. In contrast to perennial forages, the dry matter production of annual ryegrasses peaks in late summer and continues until late fall (Fig. 2). In late summer and fall, annual ryegrasses increase available pasture and provide quality feed for grazing livestock.

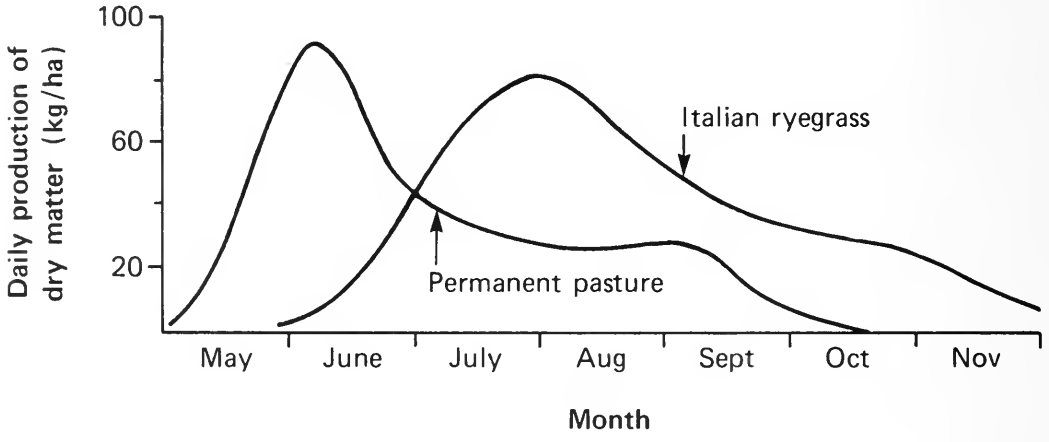

Fig. 2 Annual ryegrasses reach peak production by midsummer and continue growing until fall; they complement perennial pasture species by providing quality pasture in late summer and fall.

Dairy farmers, in particular, find annual ryegrasses useful from July onward. They are able to maintain satisfactory levels of milk production with the help of ryegrass pasture. On beef and sheep farms, producers use annual ryegrasses for grazing animals having a high nutrient requirement such as young, growing stock. When supplemented with perennial forages, annual ryegrasses extend the grazing season beyond its normal range. Having high-quality supplemental forage for a longer season increases animal returns and lowers storage costs. Farmers can also make better use of land and equipment.

Plant description

Italian and Westerwolds ryegrasses are diploids ($2n = 14$), but tetraploids may be readily produced. The seed of annual ryegrasses is oblong and 5–8 mm long. The 1000 seed weights range from 2 to 5 g, with tetraploids having larger seed size. Hectolitre weight of seed ranges from 36 to 43 kg.

Italian ryegrasses, when grown as summer annuals, remain at a vegetative stage; leaves make up to 60–80% of the whole crop. Westerwolds ryegrasses produce variable numbers of seed-bearing tillers and have a leaf content of 40–60%. The dry matter content of annual ryegrasses ranges from 10 to 20%, depending on cultivar, maturity, and season. The dry matter content of diploids is about two percentage units greater than that of tetraploids.

Cultivars

Eight cultivars are currently (1990) recommended[1] in the Atlantic Provinces (Table 1). The use of certified seed of recommended cultivars guarantees that the seed is true to variety, clean, and free of primary noxious weeds. Use of certified seed also guarantees that the cultivar chosen suits the intended purpose. Nonpedigree seed can be of inferior quality and provides no guarantee as to the type and productivity of ryegrass.

Method of establishment

Conventional cultivation

For high yields, annual ryegrasses must be sown in a firm, fine, and level seedbed as early as possible in the spring. Rolling the field prior to seeding is recommended to firm the seedbed after cultivation. Seeding rates of 20–25 kg/ha for diploids and 25–35 kg/ha for tetraploids are adequate for good stands. Use the heavier rates given for broadcast sowing. Monitor the rate of seeding carefully, because the flow rate of seed varies considerably depending on the cultivar and the type of seeder used. Seed shallow at a depth of about 1 cm, and, to ensure good germination, cover the seed and firm the soil after seeding. Cultipacker seeders and grain drills do a satisfactory job of seeding ryegrasses. Broadcast seeding works well, but light chain harrowing and rolling after seeding are necessary.

[1] For currently recommended cultivars, refer to the latest edition of *Field crop guide to variety and pesticide selection 1990 for the Atlantic Provinces* (Atlantic Agriculture Publication 100A.)

Table 1 Recommended cultivars of annual ryegrasses for the Atlantic Provinces in 1990

Cultivar (ploidy)	Use	Dry matter Yield (%)	Dry matter Digestibility (%)	Dry matter Crude protein (%)	Comments
Italian					
Barmultra (tetraploid)	Pasture Plow under	97	75	16	Leafy, satisfactory grazing tolerance
Bartolini (diploid)	Pasture Plow under	99	76	16	Persistent under grazing
Lemtal (diploid)	Pasture Plow under	100[1]	76	16	Persistent under grazing, overwinters under favorable conditions
Maris Ledger (tetraploid)	Pasture Plow under	104	79	16	Unsuitable for close grazing
Westerwolds					
Aubade (tetraploid)	Silage Pasture	119	64	15	Stemmy, suitable for cutting then for grazing
Barspectra (tetraploid)	Silage Pasture	111	68	15	Stemmy, used for cutting and grazing
Marshall (diploid)	Silage Hay Pasture	120	61	14	Very stemmy, slow regrowth in fall
Promenade (tetraploid)	Silage Pasture Plow under	104	71	16	Intermediate between leafy Italian and stemmy Westerwolds ryegrass

[1] Dry matter yield under cutting, 8.7 t/ha = 100%.

Reduced tillage

If annual ryegrasses are grown in the same field in two or more consecutive years, use reduced tillage after the 1st year. Because annual ryegrasses are usually winterkilled, cultivate only lightly to remove dead matter and prepare the seedbed. No-till drills are excellent for seeding in such fields (Fig. 3). Grain drills do a satisfactory job; direct the seed through the discs and adjust the tension on discs to obtain a seeding depth of about 1 cm. Broadcast seeding is not dependable under reduced cultivation unless good seed coverage is obtained.

Use reduced tillage also to seed annual ryegrasses either into grain stubble or following potatoes. Competition from established grasses, such as quackgrass (couch), and broadleaf weeds can be a problem with reduced tillage seedings. Control weeds as outlined in the next section.

The yields with both conventional and reduced tillage are usually equal but reduced tillage seeding is considerably faster. The cost of establishing ryegrass with reduced tillage is lower than with conventional seeding.

Fig. 3 Annual ryegrasses may be seeded using reduced cultivation or no-till drilling; this rotary strip seeder[2] shallow cultivates and seeds in one pass.

[2] Display of the manufacturer's name is not to be taken as endorsement of the product by Agriculture Canada.

Weed control

Many broadleaf weeds can suppress the seedling growth of annual ryegrasses. Control such weeds by timely defoliation or by spraying with herbicides[3]. The following herbicides are suitable for broadleaf weed control in annual ryegrasses:

Herbicide	*Active ingredient (kg/ha)*
2,4-D amine	up to 0.84
MCPA amine	up to 0.84
MCPA sodium	up to 1.26

In some instances, a cereal grain crop sown at a low rate (50–60 kg/ha) reduces weeds. To minimize competition on ryegrass, cut or graze cereal–ryegrass mixtures at the vegetative stage of the cereal crop. Weeds are not usually a problem after the first cutting because ryegrass grows vigorously. With reduced tillage, it may be necessary to suppress quackgrass (couch) and other weeds with preplant applications of glyphosate or paraquat.

Fertilization

Adequate soil fertility is the key to producing annual ryegrasses. General fertilizer recommendations are given in Table 2. A soil test will specify the type and amount of fertilizer required. Annual ryegrasses grow best when the soil pH is at least 6. Growth is also satisfactory at lower soil pH when it is not desirable to lime the soil (e.g., potato rotation). Farmyard manure worked into the seedbed before seeding is a good source of nutrients for annual ryegrasses.

A small application of nitrogen at seeding is usually necessary. Apply more nitrogen (34–0–0 at 100 kg/ha) at the two- to three-leaf stage in early summer to boost the growth. Apply additional nitrogen, as outlined in Table 2, as necessary for vigorous growth and good quality until late fall. The responses of a Westerwolds ryegrass to applied nitrogen appear in Fig. 4. For pasture, smaller but more frequent applications of nitrogen result in a uniform pasture availability and lower nitrate content in forage.

Regular applications of nitrogen throughout the growing season are essential for the good growth of annual ryegrasses. The required amounts depend on factors such as the rate of application of barnyard manure at seeding and intended use. Suggested reductions in the fertilizer rates after manure applications are outlined in Table 3.

[3] For information on weed control, refer to *Guide to chemical weed control* (Ontario Ministry of Agriculture and Food, Publication 75).

Table 2 General fertilizer recommendations for annual ryegrasses in the year of seeding

	Nutrients (kg/ha)			Example analysis	Rate (kg/ha)
	N*	P_2O_5	K_2O		
Broadcast before seeding					
Regularly limed and fertilized soils	35–50	35–50	35–50	17–17–17	200–300
Infrequently limed and fertilized soils	30–50	60–100	60–100	10–20–20	300–500
After emergence					
2- to 4-leaf stage	35–50	0	0	34–0–0†	100–150
After 1st defoliation					
For pasture	50–70	0	0	34–0–0	150–200
For conserved forage	70–85	0	0	34–0–0	200–250
After subsequent defoliation					
For pasture‡	35–50	0	0	34–0–0	100–150
For conserved forage	50–70	0	0	34–0–0	150–200

* If annual ryegrasses are grown with clovers (50% or greater), reduce the nitrogen rates by 50%.

† Other sources of nitrogen include urea (46–0–0) and calcium ammonium nitrate (27.5–0–0).

‡ Applications at about monthly intervals; last application in early to mid September; complete fertilizer such as 17–17–17 may be required.

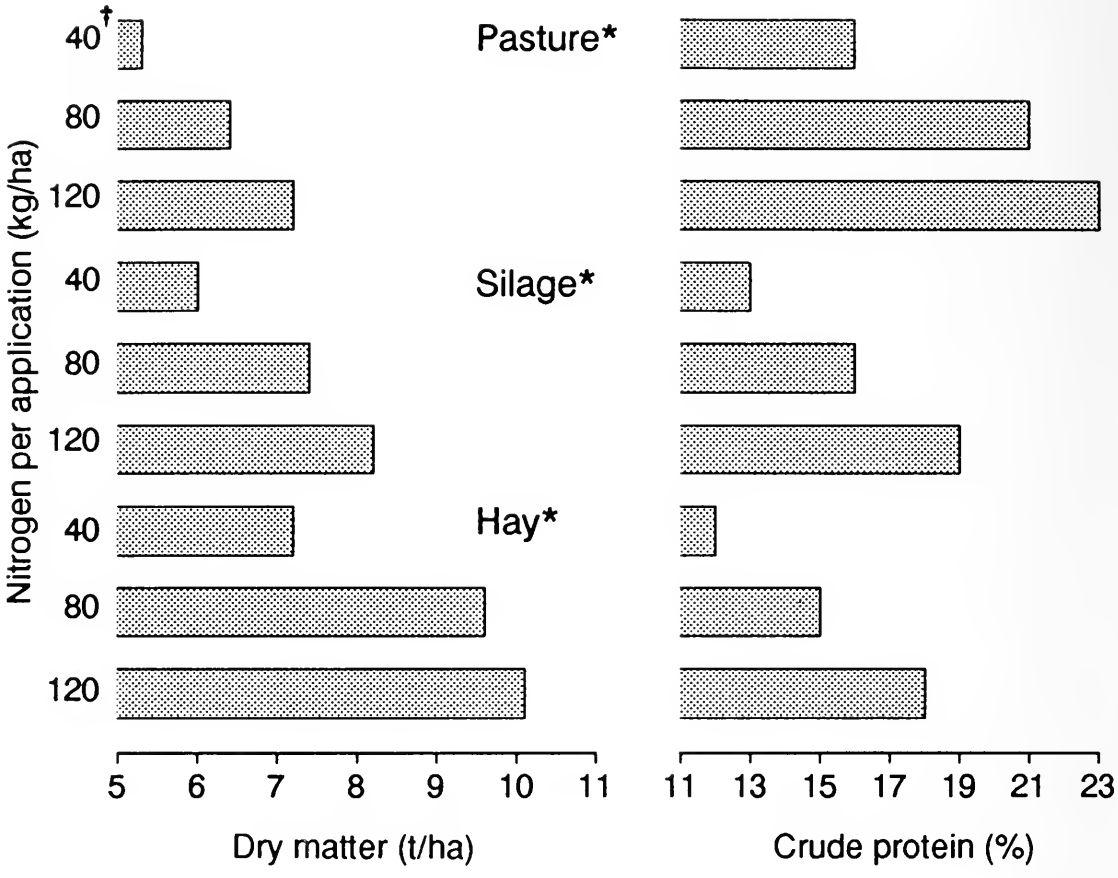

Fig. 4 Dry matter yields and crude protein content of Promenade Westerwolds ryegrass seeded in mid May. †Nitrogen applied at seedling emergence and after cuts 1 and 2 (three applications per year). *Harvest schedules:

	Cut 1	*Cut 2*	*Cut 3*	*Cut 4*
Pasture (heads emerging)	**July 10**	**Aug. 8**	**Sept. 4**	**Oct. 15**
Silage (50% heading)	**July 15**	**Aug. 18**	**Oct. 15**	
Hay (anthesis)	**July 20**	**Aug. 30**	**Oct. 15**	

Table 3 Reductions in fertilizer application where manure is applied in the same crop year[1]

Manure from livestock	Nitrogen (kg/ha)			Phosphate P_2O_2 (kg/ha)	Potash K_2O (kg/ha)
	Fall and winter[2]	Spring[3]	Spring, covered[4]		
Liquid manure at 10 m^3/ha					
Cattle, Mixed Livestock	5	10	12	4	16
Swine	8	15	19	7	14
Poultry	23	46	58	22	26
Solid manure[5] at 10 t/ha					
Cattle, Mixed Livestock	12	24	30	10	44
Swine	15	30	38	20	26
Poultry	70	140	175	75	96

[1] These adjustments are based on slightly below average quality manure.

[2] Fall and winter applied manure.

[3] Spring applied manure not covered immediately, including surface application after seeding.

[4] Spring applied manure injected or otherwise covered within one day of application.

[5] The density of manure in the spreader will vary from 400 kg/m^3 for heavily bedded or very dry manure to 1000 kg/m^3 for semi-solid or liquid manures.

Source: After Ontario Ministry of Agriculture and Food Publication 296, *1988–1990 Field crop recommendations*.

Legume–annual ryegrass mixtures

Annual ryegrasses may be grown in mixtures with forage legumes such as red clover to reduce the costs of using nitrogen fertilizer (Fig. 5). In Charlottetown the yields of legume–ryegrass mixtures without any nitrogen fertilizer were up to 84% of those obtained with nitrogen-treated ryegrass (Fig. 6). Seeding rate of annual ryegrass in a mixture should not exceed 10 kg/ha for diploids and 15–20 kg for tetraploids; seed red clover at 15 kg/ha. Grow legume–annual ryegrass mixtures on weed-free fields, because weed control may be difficult in such mixtures. An application of ammonium nitrate at 100 kg/ha after emergence is usually required for good growth. Apply additional nitrogen as required to maintain production during the growing season.

Fig. 5 Clovers and other forage legumes may be grown with annual ryegrasses; rotary mower–conditioner handles heavy growth with ease.

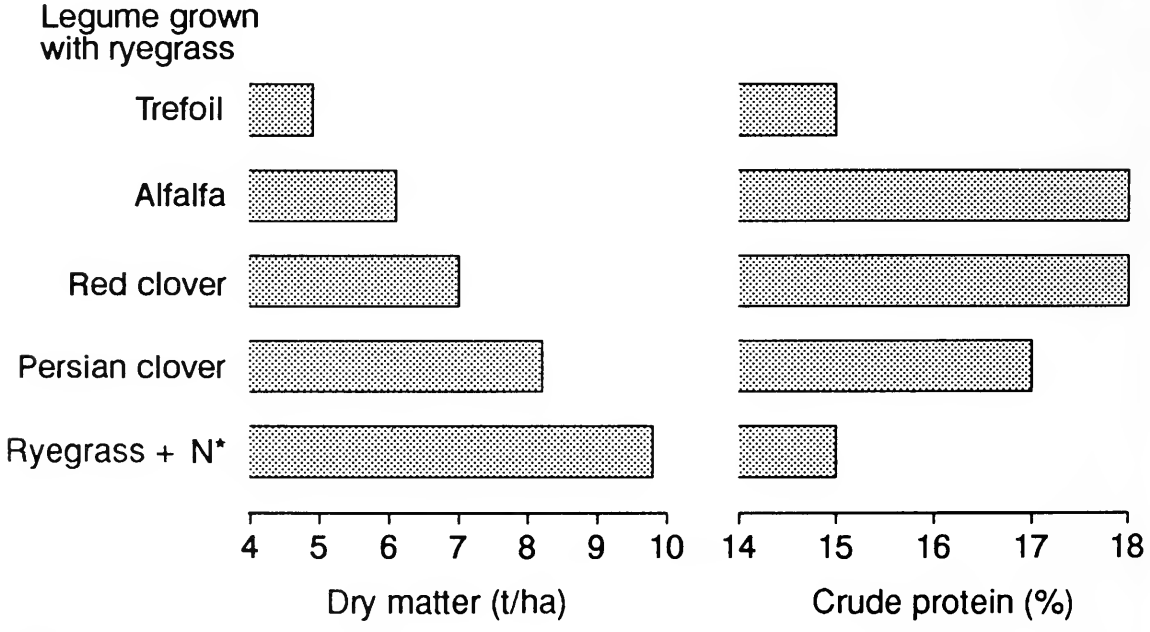

Fig. 6 Yield and crude protein content of Lemtal Italian ryegrass and legume mixtures in comparison with ryegrass fertilized with nitrogen. *Nitrogen applied in spring and after cuts 1 and 2 at 72 kg/ha; no nitrogen applied to legume–ryegrass mixtures.

Use for pasture

Annual ryegrasses are ready for grazing 6–8 weeks after seeding (Fig. 7). Accordingly, Italian ryegrasses seeded in early May are ready for grazing by late June or early July. Ryegrasses maintain high daily dry matter production and good quality until early November, thus providing good pasture during the period when perennial species are unproductive. Annual ryegrasses require a regrowth period of 2–4 weeks after grazing.

Rotational grazing of ryegrass allows efficient use of pasture. Divide the field into several paddocks, which are grazed one at a time. It is preferable to have several small paddocks and graze them in 2 or 3 days. This practice reduces waste from ungrazed patches and soiling of grass, which usually occurs on larger paddocks. The grazing cycle is about 2 weeks in midsummer but becomes longer as the season progresses and growth of grass slows.

In continuous grazing, check closely the amount of herbage available. Allow the grazing height of grass for dairy cattle to be at least 8 cm in summer and 10 cm in late season to ensure an adequate supply of ryegrass. For beef cattle, maintain the grazing height at 6–8 cm and for sheep at 4 cm or higher.

The area of ryegrass pasture required depends on the availability of permanent pasture, supplementary feeding, amount of concentrates fed, level of milk production, weather, and so on. For the best cattle performance, do not allow the average stubble height to be grazed below 8–10 cm. Grazing below this height causes grass intake to be restricted. As a general guideline, the following stocking rates for Italian ryegrass (Table 4) are based on daily herbage allowance of 15 kg dry matter for dairy cows and 8 kg dry matter for beef cattle. Ryegrass was seeded in early May, and nitrogen was applied at 65 kg/ha in early June and mid July and at 50 kg/ha in late August.

Annual ryegrasses are highly digestible. With adequate nitrogen fertilization they are also high in crude protein (Table 5). Avoid heavy applications of nitrogen fertilizer and manure (i.e., nitrogen at more than 80 kg/ha) because nitrates in young ryegrass plants may reach dangerously high levels. In general, the nitrate concentration of grass to be grazed by cows should be less than 2.0% in dry matter. For cattle grazing succulent ryegrass, provide access to some hay or roughage. Roughage enables the rumen to function well and helps to maintain adequate butterfat levels in milk.

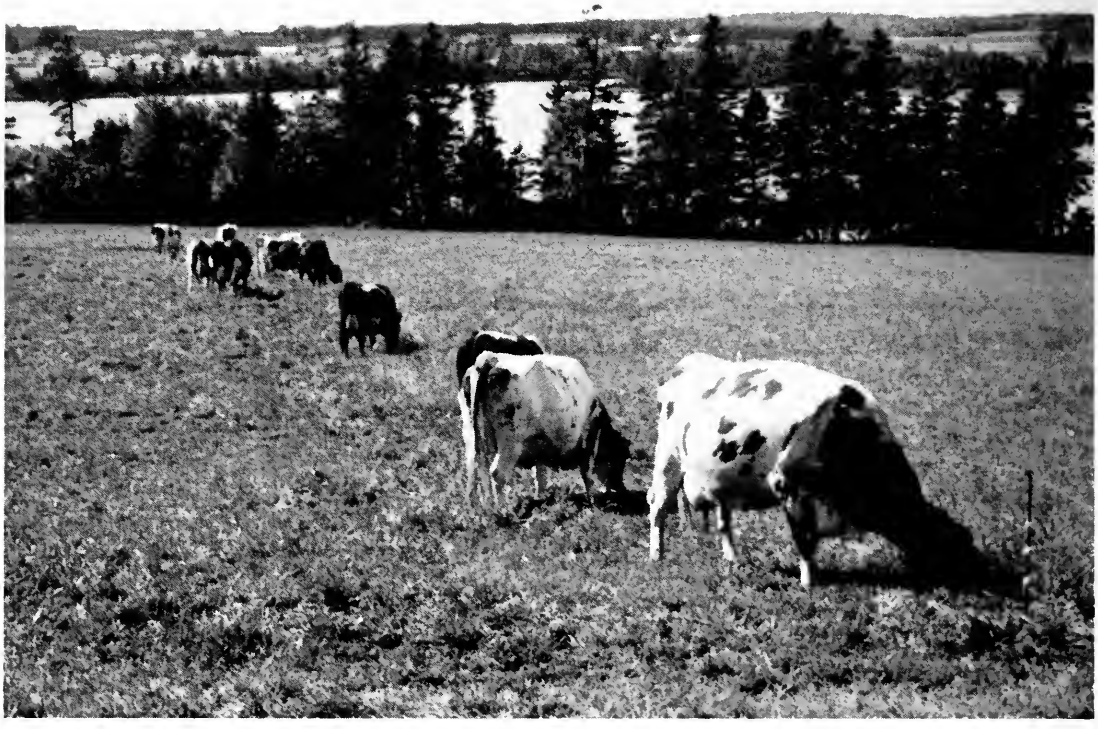

Fig. 7 Italian ryegrasses are ready for grazing about 6 weeks after seeding; high-voltage electric fencing simplifies strip grazing.

Table 4 Stocking rates and daily dry matter production of Italian ryegrass

Grazing period	Dairy cows (per ha)	Beef cattle (per ha)	Sheep (per ha)	Daily dry matter production (kg/ha)
July	5	10	30	75
August	4	8	24	60
September	3	6	18	45
October	2	4	12	20

Table 5 Yields and quality of Lemtal Italian ryegrass under grazing

Time of grazing	Dry matter yield (kg/ha)	Daily dry matter production (kg/ha)	Dry matter		
			Crude protein (%)	Digestibility (%)	Nitrate (%)
11 July	1375	46	19	82	0.4
24 July	931	72	31	77	2.9
12 August	1556	82	21	77	1.2
5 September	1442	60	21	79	0.8
30 September	982	39	26	78	1.6
7 November	1137	30	25	77	0.7

Note: Trial seeded on 26 May 1981; fertilized at seeding with 17–17–17 at 450 kg/ha and on July 14 and August 13 with 200 kg/ha of ammonium nitrate. Data from Charlottetown Research Station.

Haylage and hay

Westerwolds ryegrasses are more suitable for ensiling and hay making than are low-growing Italian ryegrasses. Aubade, Barspectra, and Marshall are erect, stemmy Westerwolds ryegrasses suitable for cutting. Promenade is an intermediate type between leafy Italian ryegrass such as Barmultra and the more stemmy cultivar Aubade. Harvest Westerwolds ryegrasses at the early heading stage for optimum yield and quality. Cut Italian ryegrasses before the bottom leaves start dying. Because annual ryegrasses may accumulate high nitrate concentrations, avoid excessive nitrogen applications. If manure is applied, adjust rates of nitrogen fertilizer to take into account nitrogen available from manure, as outlined in Table 3. Hay or haylage containing more than 0.8% nitrate in the dry matter may be toxic to livestock.

Rotary mower–conditioners (Fig. 5) are well suited to cutting both Italian and Westerwolds ryegrasses as they handle wet and leafy material without plugging. Sickle bar mower–conditioners, when well maintained and adjusted properly, will also do a satisfactory job of cutting, particularly the coarser Westerwolds ryegrasses.

The low dry-matter content of annual ryegrasses may make them difficult crops to conserve. Wilting harvested grass to 30–50% dry matter improves ensiling properties of annual ryegrasses and eliminates seepage from the silo. Field curing of hay may be difficult, particularly under humid conditions and late in season. Spoilage occurs readily unless low moisture content in hay is attained. To assure safe storage, use barn driers to cure ryegrass.

Cover crops and soil improvement

Ryegrasses are grown increasingly in rotations with potatoes and other crops to maintain a soil's content of organic matter, to improve its structure thus making the soil easier to till, and to reduce erosion. Ryegrasses help to alleviate problems associated with intensified cash-crop farming and shorter rotation periods. The best time to seed ryegrasses as cover crops is in the spring and early summer. Ryegrasses can be seeded until early August for erosion control, but successful establishment may be hampered by lack of moisture after seeding. Ryegrasses sown after early September have insufficient time for a good establishment and root biomass will be low.

Italian ryegrasses and the leafy Westerwolds ryegrass Promenade produce a large root mass, which averages 5 t/ha of dry matter in the seeding year (Fig. 8). Aubade, Barspectra, and Marshall Westerwolds ryegrasses produce more than 3 t/ha, a root mass similar to that of red clover and alfalfa. The large, fibrous root mass of annual ryegrasses adds organic matter to the soil, which binds soil together and provides good soil structure. Greater levels of organic matter not only improve the soil's water-holding capacity, water infiltration, and level of water-stable aggregates but also increase the soil's resistance to compaction and erosion. In continuous cultivation, Italian ryegrass resulted in soil organic matter of 3.6% as compared with 3.0% for spring wheat and soybeans over a 4-year period.

Fig. 8 Italian ryegrasses have a fibrous and voluminous root system that is excellent for soil organic matter, soil structure, and crop growth.

Growing annual ryegrasses in rotations has other beneficial effects. Annual ryegrasses are poor hosts for the root lesion nematode and are non hosts for the clover cyst and northern root-knot nematodes, so growing the ryegrasses in rotations may alleviate these pest problems.

Underseeding

Cereal crops such as barley may be undersown with annual ryegrasses to provide ground cover, green manure for soil organic matter, or late pasture. Italian ryegrasses are low growing and therefore remain below combine cutting height in a standing cereal crop (Fig. 9). Westerwolds ryegrasses may interfere with combining because they reach a height similar to cereals. It is important that cereal crops grow vigorously to avoid excessive competition from ryegrass. For annual ryegrass grown with cereal crops, sow diploid varieties at about 10 kg/ha and tetraploids at 15 kg/ha. Early cereal harvest leaves sufficient time for ryegrass to produce heavy growth for grazing or plowing under. Applying ammonium nitrate (33–0–0) at 150 kg/ha by early September promotes the growth of ryegrass in the fall.

Fig. 9 Barley underseeded with Italian ryegrass; early harvesting of barley allows ryegrass to develop heavy root mass and top growth.

Seed production

Seed production by some Westerwolds ryegrasses in the year of seeding is possible in the Maritime Provinces. Aubade and Marshall, both recommended Westerwolds ryegrasses, yielded from 700 to more than

1000 kg/ha of seed in Charlottetown. These were the only recommended annual ryegrass varieties that produced adequate seed yields in the year of seeding. Seed production by Italian ryegrasses occurs in the year after seeding only in locations with very favorable conditions for overwintering.

For seed production of annual ryegrasses, keep fields free of other grasses such as quackgrass (couch) and wild oats. Follow procedures for conventional seeding as outlined in section on "Stand establishment." For Westerwolds ryegrasses, apply a complete fertilizer (e.g., 17–17–17 at 300–400 kg/ha) before seeding. Then apply ammonium nitrate at 100 kg/ha at the three- to five-leaf stage. If an additional seed harvest is attempted, Italian ryegrasses in the postseeding year require one application at 200–250 kg/ha of ammonium nitrate in the spring and another after the first harvest. Phosphate and potash may be also required. Control broadleaf weeds by spraying with approved herbicides. The current requirements for seed certification (such as isolation, grade of seed to be sown, and inspection) are available from the Canadian Seed Growers' Association.

Seed of annual ryegrasses may start shedding at 43–45% seed moisture. It is therefore important to monitor the seed moisture content carefully and start harvesting before severe shedding occurs.

Annual ryegrasses are usually swathed at about 45% seed moisture and combined from the swath at about 35% seed moisture. If annual ryegrasses are direct combined, careful timing is essential to avoid significant losses from shedding. As the seed moisture content approaches 35%, annual ryegrasses become very vulnerable to such losses. The recommended seed moisture contents for direct combining are 40% for tetraploid and 37% for diploid ryegrass varieties. The speed of the drum beater should not exceed 23 m/s to safeguard seed germination. Adjust the combine according to the manufacturer's recommendations.

Dry ryegrass seed very carefully. Seed harvested at high moisture content is vulnerable to a rapid loss of germination from heating. The following recommendation for drying annual ryegrass seed (Table 6) is from *Seed growers leaflet no. 8* (National Institute of Agricultural Botany, UK):

> "Supplemental heat should be used only in the final stages of drying and even then should be no more than is necessary to reduce the relative humidity to 65%. The seed should be stored at 13–14% moisture and ventilated periodically throughout the storage period."

Table 6 Air flow and temperature for drying ryegrass seed

Moisture in seed (%)	Air flow per tonne (m/min)	Air temp. (°C)
45	28	38
40	22	49
35	16	54